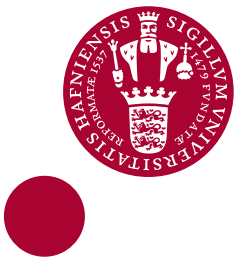

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Concepts, paradigms and knowledge organization

Abstract
It is argued that concepts are the building blocks of knowledge organizing systems (KOS). Objections to this view are considered and answers are provided. By implication the theory of concepts constitutes the foundation for knowledge organization (KO). The theory of concepts is understood as related to and derived from theories of knowledge. Different theories of knowledge such as empiricism, rationalism, historicism and pragmatism imply different theories of concepts. Such different epistemologies and their associated theories of concepts represent different methodological ideals which probably compete in all knowledge domains. Different approaches to KO are also in fundamental ways associated with different theories of concepts. The paper holds that the historicist and pragmatic theory of concept should be considered most valuable. By implication is it is necessary to know about competing theories in the fields being organized. A further implication of the pragmatic view is that the construction of a KOS must be understood as a way of participating in the discourses in the domain that is being represented.

1: The building blocks of knowledge organization

The concept of knowledge organizing systems (KOS) is not going to be addressed in this paper, but it is assumed that examples of KOS are, for example, library classification systems, scientific classification systems, thesauri, dictionaries and ontologies. What is it that is being organized in KOSs? What are the elements? Possible answers could be:

- Words
- Signs/symbols
- Classes
- Concepts
- "Universals and particulars which exist in reality"

In a way, of course, a thesaurus consists of words. Some of these words are, however, considered synonyms in a given thesaurus: one of the words is chosen (and termed *descriptor*) and the synonyms are referring to the chosen term by means of the "use" relation (these other words are termed *lead-in terms*). Other words are homographs. In thesauri similar words with different meanings are separated by means of parenthetical qualifiers, e.g. `Letters (Alphabet)` and `Letters (Correspondence)`. The basic elements in a thesaurus may thus be considered concepts (understood as words representing the meaning of synonyms which have been disambiguated from similar words with different meanings). These concepts are thus organized alphabetically (and sometimes also systematically) with a substructure representing relations among concepts (i.e. semantic relations). In this sense, I argue, concepts are the units in all forms of KOS.

Classification systems like Dewey Decimal Classification organize classes and classes are represented by symbols (words are used, among other things to refer to classes from the alphabetical index). In my opinion, however, for all important theoretical uses, a class may be considered a concept and vice versa. A classification is thus a structure of concepts (classes) mainly based on one kind of semantic relations: the generic relation, which is one kind of hierarchical relation.

In this way I have argued (e.g. Hjørland 2007) that concepts should be considered the building blocks of all forms of KOS. If it can be assumed that this reasoning is correct,

it follows that the understanding of KOSs (and criteria for construction and evaluation of KOSs) is founded in the broader field of concept theory. The whole idea in doing so is to provide a better theoretical basis for knowledge organization (KO) which considers relevant contributions from any discipline which turns out to have the potential to contribute to concept theory.

There seems to be overall agreement that concepts should be considered the building blocks of KOS. Among the researchers arguing that concepts are the basic elements in KOS is the founder of ISKO, Ingetraut Dahlberg. She wrote:

> "A concept is regarded as the common element of both classification systems and thesauri" (Dahlberg 1974, 12)

Dahlberg's view is also reflected in the subtitle of ISKO's journal *Knowledge organization*: "International journal devoted to *concept theory*, classification, indexing and knowledge representation".

There are however some researchers who disagree with this. Smith (2004) thus "defends the thesis that ontologies developed for such purposes should be understood as having as their subject matter, not concepts, but rather the universals and particulars which exist in reality and are captured in scientific laws" (emphasis added). Below we will return to this issue after having considered concept theory.

2: Concept theory

In Hjørland (2009) the field of concept theory was examined. I demonstrated that the way scholars tend to define a given concept is related to their methodological ideals and that basically four kinds of ideals seem to compete in all fields of knowledge:

The ideal of empiricism: To define concepts by clustering similar objects (relying on features that can be observed "objectively" and avoiding theoretical selection of defining properties). A concept is thus the name associated with such a cluster.

The ideal of rationalism: To define concepts by a set of primitive concepts (or "semantic primitives") considered "given".

The ideal of historicism: To define concepts (a) genealogically and (b) by explicating their relations to theories and discourses.

The ideal of pragmatism: To define concepts by deciding which class of things best serves a given purpose and then to fixate this class in a sign.

In the article I used the biological concept "species" and demonstrated that all four ideals can be found in different views on the species concept in the contemporary biological literature. I also argued that the historist and pragmatic understandings of concepts are the most fruitful understandings for KO and I suggested the following definition:

> "Concepts are dynamically constructed and collectively negotiated meanings that classify the world according to interests and theories. Concepts and their development cannot be understood in isolation from the interests and theories that motivated their construction, and, in general, we should expect competing conceptions and concepts to be at play in all domains at all times." (Hjørland 2009, 1522-1523).

Different epistemologies and views of concepts underlie all existing approaches to the construction of KOSs.

Statistical methods like cluster analysis are closest to the ideals of empiricism,
methods like facet analysis and formal concept theory are closest to the ideals of rationalism,

methods like "Begriffsgeschichte" and evolutionary reconstruction are closest to the ideals of historicism while
"critical" and feminist approaches are closest to the ideals of pragmatism.

Typically such different methods do not produce similar results, so it is not just a matter of personal preference whether one or another method is used. The relative weaknesses and strengths of different approaches are an important research question for the field of KO.

These four categories of approaches cross the dichotomy of human classification versus machine classification. The instruction given to human indexers may be more or less informed by one or another of those four approaches. In a similar way algorithmic approaches may be more or less corresponding to one or another of these approaches, although the empirist ideals are much more easily fulfilled by an algorithm. When human classification is performed in a rather simplistic, mechanical or rule-based way, it tends to reflect the empirist or rationalist epistemology.

3: Criticism of concepts as units

As written above Smith (2004) suggested that ontologies (i.e. KOSs) should not be based on concepts, but "rather the universals and particulars which exist in reality and are captured in scientific laws". If one does not like a word (e.g. *concept*), there are two logical options: (1) avoiding the word and using another, (2) suggesting (or finding) a new meaning of the word. Smith clearly chose the first possibility, while I argue for the second. Other people, like John Sowa, also seem to prefer another term (although based on different arguments). Sowa wrote:

"I have been reading much more of Peirce's writings in the past 25 years, and I would now follow CSP [Charles Sanders Peirce] in saying that a concept is a sign. But that doesn't say much, since Peirce had an elaborate classification of signs. For him, every thought, every feeling, every experience, and even the mind itself is a sign.

For Peirce, every interpretation of a sign is another sign. The word 'cat' and an image of a cat could both be interpreted by the same sign, which is usually called a concept of a cat.

Peirce also went into great detail about how the interpretations of signs can "grow" – he summarized it in just two words: "Symbols grow". He also said that the listener's interpretation of what a speaker might say could be less developed or sometimes more developed than what the speaker had intended – but it is almost never identical to what the speaker intended. […]

I believe that many philosophers who grew up on 20th century analytic philosophy desperately need some remedial study of CSP. Following is a paper I wrote on that topic [Sowa, 2006]." (Sowa 2009)

Thus Smith prefers "universals and particulars" in-stead of concepts as the building blocks of KOSs, while Sowa seems to prefer "signs" (but recognize that a concept is a special kind of sign for which he does not suggest a new name, so he may still accept it).

The reason why Smith wants to avoid the word *concept* is that for him it is associated with philosophical idealism. He wrote:

"It is a matter of considerable astonishment to ontology-minded philosophers that many thoughtful members of the knowledge representation and related communities, including many of those involved in the development of ontologies, have embraced one or other form of idealist, skeptical, or constructionist philosophy. This means for example:

a view according to which there is no such thing as objective reality to which the concepts or general terms in our knowledge representation systems would correspond;

a view according to which we cannot know what objective reality is like, so that there is no practical benefit to be gained from the attempt to establish such a correspondence;
a view according to which the term 'reality' in any case signifies nothing more than a construction built out of concepts, so that every concept-system would in principle have an equal claim to constituting its own 'reality' or 'possible world'." (Smith 2004)

I agree with Smith that our KOSs should correspond to reality as uncovered by science (broadly understood). I believe that Smith is against a tendency to psychologism and cognitivism that I have also often argued against. Concept theory has been dominated by psychological studies rather than by studies of concept formation in science. The brief answer to Smith's argument is that I find that a realist theory of concepts is possible. That said, there seems to remain some disagreements between Smith's view and mine. Smith wrote:

> "At the level at which I operate I do not embrace any one classification and say: this classification represents reality, and all others do not. Rather, I say that we should each choose the best classification, on the basis of the best current scientific understanding, and assume that it represents reality UNTIL WE RECEIVE EVIDENCE TO THE CONTRARY. […]
>
> Thus I do not deny the existence of other views – clearly there are at any given stage many views, and there may be, at any given stage, two or more views both of which have equal scientific merit. My advice then would be to embrace neither, but to keep working to find out which is right.
>
> What is the alternative to my view? To accept that all classification systems are equally good, because they all refer to corresponding concepts, precisely tailored to the classifications you start with. Classification becomes easy. We never need to care about reality, or science, at all." (Smith 2009, emphasis in original).

Logical positivism spoke much about verified facts as the foundation of science. This view has, however, lost influence. Today research is seen much more connected to theoretical assumptions and as without any absolute foundation. Peirce, Popper and Kuhn, among others, regarded scientific knowledge as by principle fallible. I agree with this principle of fallibilism. Perhaps the difference between Smith's view on the one hand and Sowa's and my view on the other hand is based on different views in the philosophy of science, where Smith is closer to logical positivism, whereas Sowa and I are closer to pragmatism?

The implication of fallibilism, pragmatism and related philosophies is that we can never be certain that the true classifications have been found (and thus that *we cannot make any KOS if we have to wait until certainty is established*). The first alternative mentioned by Smith to construe KOSs "on the basis of the best current scientific understanding, and assume that it represents reality until we receive evidence to the contrary" is one the one hand correct (we certainly should construe KOSs on the basis of the best current scientific understanding). On the other hand, however, it may be dangerous to assume one true solution to be (easily) read out of the scientific literature and that one solution is the best for different purposes. The normal view today is that competing theories operate in any domain. These theories are often based on different "paradigms" related to the four methodological ideals presented above, which also implies different conceptualizations. If we are not prepared for this, we may simply select a dominant view and not realize that it does not necessarily represent the truth or the optimal solution when different interests are at play.

4: Conclusion

Criticism of concepts as units in KOSs seems to be based on a philosophical position which does not consider scientific concepts, theories and findings "mediated" by background assumptions. If science is seen as a rather mechanical accumulation of "facts" then, by implication, the units of KOSs are "universals and particulars which exist in reality". If, on the other hand, scientific knowledge is understood on the basis of competing methodological ideals, then it makes sense to ask "which conception are we dealing with"? It makes sense to consider claims about relations among things in the world to be connected with larger "paradigms". From this last perspective it would seem very problematic not to inform users about the different opinions at play. To accept "concepts" as units in KO by implication means to accept the theory-laden nature of KO and to realize that specific KOSs are supporting specific views about the knowledge being organized. To construe a KOS is to take part in the interests and discourses within the domain that is being represented.

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